Journal of the Society of Arts.

FRIDAY, AUGUST 21, 1868.

Announcements by the Council.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

PRIZES.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

HARVESTING CORN IN WET WEATHER.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

SUBSCRIPTIONS.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

CANTOR LECTURES.

The publication of Dr. Letheby's Course of Lectures "On Food" will be resumed next week.

Proceedings of Institutions.

EXAMINATION PAPERS, 1868.

(*Continued from page* 671.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last :—

PRACTICAL MECHANICS.

THREE HOURS ALLOWED.

1. Define a *pinion*, a *rack*, a *crown-wheel*, an *annular wheel*, the *pitch-circle* of a toothed wheel, and the *pitch* of a screw. Distinguish between a right-handed and a left-handed screw. How are screws cut in a lathe?

2. Explain the following contrivances :—(1) A *mangle-wheel;* (2) a *ratchet-wheel;* (3) a *fusee;* (4) a *heart-wheel;* (5) the *Geneva stop.*

3. Describe some method of connecting two parallel shafts by a single belt and wheelwork, so as to enable the continuous rotation of one shaft to be communicated to the other, either in the same or in opposite directions. How may the rotation of the second shaft be stopped when required?

4. Two parallel axes, which do not overlap, are so close together as to be nearly in the same line, and it is wished to communicate motion from one to the other, so that the axes shall rotate in *opposite* directions, with angular velocities in the ratio of 2 to 3. Find a train of wheels by which this may be done.

5. Explain the necessity of providing turning lathes with contrivances for varying the relative velocities of the mandril and foot-wheel, and describe some arrangement for this purpose.

6. Mention some examples of aggregate motion. Describe any form of self-acting drilling machine, whereby a drill is made to rotate rapidly and at the same time to advance slowly.

7. Explain the principle of the movement adopted in machinery for twisting strands into a rope.

8. Describe the great improvement introduced by Watt into the construction of the steam-engine. Distinguish between single-acting and double-acting engines.

9. Describe the construction of a piston. Explain the method adopted for keeping the piston and piston-rods steam-tight.

10. Describe the locomotive slide-valve, and explain its action. Why is the use of this slide-valve restricted to engines of short stroke?

11. What do you mean by *lead*, *lap*, and *cushioning?* In what way does *lap* ensure expansive working? When is *lead* necessary?

12. Explain the principle of the movement known as Watt's parallel motion.

MAGNETISM AND ELECTRICITY.

THREE HOURS ALLOWED.

1. What is the nature of magnetism, and how is it related to an electric current?

2. Describe the construction and use of the dipping-needle.

3. State the source and mode of correcting any particular kind of deviation to which a ship's compass is liable.

4. Mention any periodic phenomena by which the earth's magnetism is supposed to be influenced.

5. Explain diamagnetism, and state some substances by which this property is manifested.

6. State your views of the nature of electricity, and your reasons for entertaining them.

7. What is the difference between an electrometer and an electroscope? Describe the electrometer of Coulomb, or Thomson.

8. Explain the construction and use of a condenser.

9. By what means can you show that Franklinic and Voltaic electricities are identical?

10. Describe the construction of a Grove's cell, and explain how the current is produced.

11. Describe the process of electro-gilding.

12. Describe an "astatic" needle. Under what conditions is it actually *astatic;* and when these are not fulfilled, determine its position of equilibrium.

13. Explain the cause of electro-dynamic rotation, as exhibited in any well-known apparatus.

14. Explain the construction of an inductorium, and the means of intensifying its action.

15. Explain the magneto-electric telegraph of Henley, Siemens, or Wheatstone.

16. Describe the construction of some electro-dynamic machine, *i.e.* for obtaining motive power. What is the chief obstacle to its practical employment?

17. What is the chief cause of the retardation of signals transmitted through a submarine cable?

18. Explain the action of electricity on the nerve and muscle of a recently-killed animal.

LIGHT AND HEAT.

THREE HOURS ALLOWED.

GEOMETRICAL OPTICS.

1. Enunciate the law of the reflection of light at the polished surface of a body, and find the *position* of the image of a luminous point which is situated in front of a plane mirror. Apply the result just found to determine the *form* and *position* of the image of an object placed before a plane mirror, and *trace* the visual pencil by which the eye, in a given position, sees any given point in the object.

2. Find the *form* and *position* of the image of a distant object produced by a small *concave spherical* mirror. Describe the *Newtonian* reflecting telescope, and show how to find its magnifying power.

3. Describe the structure of *the eye* as far as its optical properties are concerned, and show how *inverted images* of objects are formed upon the retina. Explain why the chief refraction takes place at the cornea, and show how the law of *visual direction* explains the *erect* appearance of objects through the means of the *inverted* image upon the retina.

4. Describe the construction of the *achromatic* object lens of a telescope, showing how the *achromatism* and *aplanatism* are produced. Find the *magnifying* power of the *astronomical* refracting telescope with a single eye-lens, and also the proper position of the eye-hole.

PHYSICAL OPTICS.

5. Explain what is meant by the *double refraction* of light in crystalline bodies, and give examples of *uniaxal* and *biaxal* crystals, stating why they have received these names.

6. Show how the property of *polarization* of a beam of light is exhibited by a rhomb of calc spar, and give Malus' rule for the brightness or intensity of each of the two polarized beams when analyzed in any given plane.

7. Explain what are meant by the interference colours of *thin plates,* and give examples where they are seen. Explain how *Newton's rings* are produced; and show how the values of the luminiferous interval for different colours of light were calculated from Newton's observations of them.

8. Describe some form of a polariscope by which the interference of *polarized light* exhibited by thin natural plates of mica and selenite can be witnessed. Give the explanation of the way in which the colours are produced, and explain how the *selenite designs* are constructed.

HEAT.

9. Describe the mode of constructing a *standard* mercurial thermometer, and find the formula for comparing the degrees on Fahrenheit's, the centrigrade and Reaumur's scales. When the temperatures on Fahrenheit's scale are 80 degrees and 16 degrees, what are the corresponding temperatures on the centrigrade and Reaumur's scales.

10. Explain what is meant by the *boiling point* of a liquid, and show how it varies with the height of the barometer. How are *the heights* of mountains ascertained by observing the temperature of boiling water on their summits?

11. State what is meant by the expansibility of bodies by increase of temperature. Explain how the different expansibilities of brass and steel are made available in the construction of the *compensation balance-wheel* of a chronometer. From what cause is such construction required?

12. Explain the principle and mode of action of the double-acting condensing steam-engine. What is meant by the term *using the steam expansively* in the working?

(*To be continued.*)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, NORWICH, 1868.

The thirty-eighth meeting of the British Association commenced on Wednesday last with the general committee meeting, at one o'clock, when the following report of the council was read by Professor Hirst:—

"The council have received reports from the general treasurer and from the Kew committee at each of their meetings, and their reports for the past year will be laid before the general committee.

"Owing to the death of Lord Wrottesley, the chairman and most active member of the parliamentary committee, no report of this committee is presented this year.

"At their meeting on March 14th, Mr. F. Galton, general secretary, informed the council that considerations of health precluded him, to his sincere regret, from continuing to hold office. The council, in accordance with their previous practice, appointed a committee, consisting of the general secretaries and the gentlemen who had formerly filled that office, for the purpose of reporting a recommendation to the council of a successor to Mr. Galton. From this committee the council received the following report:—'Resolved, that Dr. T. Thompson, F.R.S., &c., be recommended as highly qualified for election as joint general secretary of the association.' The council recommend that Dr. T. Thompson be now elected joint general secretary.

"At the last meeting of the association the general committee referred to the council a resolution relating to the natural history collections of the British Museum, in which it was recommended to press on the Government the importance of transferring the control of these collections from the board of trustees to a single officer of Government responsible to Parliament. After deliberating on the report of a committee specially appointed to consider the question, the council sent a deputation to urge on the Government the desirability of making the proposed changes.

"Professor Martins, of Montpellier, and Professor Mannheim, of Paris, who attended the meeting of the association at Dundee, have been elected corresponding members by the council.

"The annual report of the association for last year has been issued in an improved form, and at an earlier date than usual. It is hoped that with the co-operation of the authors of reports, it may in future be published at a still earlier period, and thereby its utility much increased.

"Owing to the modifications made at the Birmingham

meeting in the arrangements of Section D, the council have had under consideration the advisability of omitting the word 'Ethnology' in the designation of Section E. They recommend that a resolution to this effect be passed by the general committee.

"The council have been informed that invitations for 1869 will be presented by deputations from Exeter, Liverpool, Edinburgh, and Brighton; and an invitation for the following year by a deputation from Bradford."

It was then announced that the following gentlemen had been nominated as presidents, vice-presidents, and secretaries of the various Sections, and they were all elected unanimously:—

Section A (Mathematical and Physical Science).—Professor Tyndall, LL.D., F.R.S., president; Admiral Manners, F.R.S., President of the Royal Astronomical Society, and Professor H. J. Stephen Smith, F.R.S., vice-presidents; Professor G. C. Foster, M.A., and R. B. Hayward, M.A., secretaries.

Section B (Chemical Science).—Professor Frankland, F.R.S., president; Professor W. A. Miller, D.C.L., F.R.S., and Warren De La Rue, Esq., F.R.S., vice-presidents; Dr. Brown, F.R.S.E., F.C.S., Dr. Russell, F.C.S., and F. Sutton, Esq., F.C.S., secretaries.

Section C (Geology).—R. A. C. Godwin-Austen, Esq., F.R.S., F.G.S., president; Professor Huxley, F.R.S., and Professor Harkness, F.R.S., vice-presidents; and G. W. Pengelley, Esq., F.R.S., and the Rev. H. Winwood, M.A., F.G.S., secretaries.

Section D (Biology).—Rev. M. J. Berkeley, M.A., F.R.S., president; W. H. Flower, Esq., F.R.S, and E. B. Taylor, Esq., F.R.S., vice-presidents; and Dr. M. Foster, H. L. Stainton, Esq., F.R.S., the Rev. H. B. Tristram, M.A., F.R.S., and Dr. E. Percival Wright, F.L.S., secretaries.

Section E (Geography and Ethnology).—Captain Richards, F.R.S., hydrographer to the Royal Navy, president; Sir Henry Rawlinson, Bart., F.R.S., vice-president; and H. W. Bates, Esq., assistant secretary to the Geographical Society, Clements R. Markham, Esq., F.R.G.S., and Thos. Wright, Esq., M.A., secretaries.

Section F (Economic Science and Statistics).—Samuel Brown, Esq., president of the Society of Actuaries, president; Sir H. Jones, Bart., vice-president; and Professor Leone Levi, F.R.S., Edward Macrory, Esq., M.A., and Frederick Purdy, Esq., F.S.S., secretaries.

Section G (Mechanical Science).—G. P. Bidder, C.E., president; C. Hutton Gregory, Esq., president of the Institution of Civil Engineers, and J. Whitworth, D.C.L., F.R.S., vice-presidents; and P. Le Neve Foster, Esq., M.A., and J. F. Iselin, Esq., M.A., secretaries.

The inaugural address of Dr. J. D. Hooker, F.R.S., the President of the year, to whom the Duke of Buccleuch resigned the chair, was delivered on Wednesday evening, in the Volunteer Drill-hall. An audience of about 1,700 persons was present. The following is an abstract of the address:—

After some opening remarks the President said:—I propose to offer you some remarks upon several matters to which the attention of your Council was directed when at Dundee, and then upon some of the great advances that have been made in botany during the last few years—this will infallibly drag me into Darwinism; after which I shall allude to some matters connected with that dawning science, the early history of mankind, a theme which will be a distinguishing collateral feature of the Norwich Association. If in all this I disappoint you, it will be my solace to hope that I may thereby break the fall of some future President, who, like myself, may have all the will, but not the time, adequately to meet your great expectations. Before commencing, however, I must allude to a circumstance which cannot but be uppermost in the minds of all habitual attendants at these annual gatherings; it is that, but for a severe accident, there would have been present here to-night the oldest surviving, and indeed the first but two, of the Presidents of the British Association; my geological friends will understand to whom I allude, as that rock of science in whom age and the heat and shocks of scientific controversy have wrought no metamorphosis, and developed no cleavage planes—a man of whom both Norwich and the Association are proud—your Canon, our father, Sedgwick. My first duty as President is the pleasant one of introducing to you the members of the International Congress of Pre-historic Archæology, who under the presidency of Sir John Lubbock, himself a master of this branch of knowledge, open their third session to-morrow in this city. The researches which specially occupy the attention of the Congress, are, perhaps, the most fascinating that ever engaged the faculties of man, and pursued as they now are in a scientific spirit, and in due subjection to scientific methods, they will command all the sympathy, and their meetings will receive all the support, that my fellow members of the British Association can afford to them. . . . . The next subject which I have to bring officially before you, relates to the action of a committee which your Council appointed to represent to the Secretary of State for India 'the great and urgent importance of adopting active measures to obtain reports on the physical form, manners, and customs of the indigenous populations of India, and especially of those tribes which are still in the habit of erecting megalithic monuments.' Upon consideration the committee decided that it would be better in the first instance to direct the attention of the Secretary of State to the last-mentioned tribes only, both because the whole inquiry was so vast, and because systematic efforts are now being made by the Indian Government to obtain photographs and histories of the native Indian tribes. Their efforts are, as regards the photographs obtained in India, eminently successful . . . It will, no doubt, surprise many here to be told that there exists within 300 miles of the British capital of India a tribe of semi-savages, who habitually erect dolmens, menares, cysts, and cromlechs, almost as gigantic in their proportions as, and very similar in appearance and construction to, the so-called Druidical remains of western Europe; and, what is still more curious, though described and figured nearly a quarter of a century ago by Colonel Yule, the eminent Oriental geographer, except by Sir J. Lubbock, they are scarcely alluded to in the modern literature of prehistoric monuments . . . After referring to Colonel Yule's visit to this country in 1844, and also to one made by himself, the President went on to say:—Of late, the country has been more opened up, and the establishment of a British cantonment among them renders it all the more important that the inquiry into their origin, language, beliefs, customs, &c., should be followed up without delay. This will now be done, thanks to your representations, and I cannot doubt but that it will throw great light upon that obscure and important branch of prehistoric archæology, the megalithian monuments of Western Europe. The council of the association, upon the recommendation of the Biological Section, appointed a committee to report upon the subject of the government of the natural history collections of the British Museum, which resulted in a deputation, who represented to the Prime Minister that it was desirable that these collections be placed under the control of a single officer, who should be directly responsible to a Minister of the Crown; and that this opinion was shared by an overwhelming majority of British naturalists. The reasons stated were that there appeared no reason why the national collections of natural history should be administered in a way different from that which was found applicable to the Royal Gardens and Botanical Collections at Kew, the Museum of Practical Geology, and the Royal Observatory at Greenwich; and that the interposition of any board or committee between the superintendent of the collections and the Government must interfere with the responsibility of the superintendent and the efficient control of the Minister. . . .

Much as has been written upon the uses of museums, I believe that the subject is still far from being exhausted; for in the present state of education in this country, these appear to me to afford the only means of efficiently teaching to schools the elements of zoology and physiology. I say in the present state of education, because I believe it will be many years before we have school masters and mistresses trained to teach these subjects, and many more years before either provincial or private schools will be supplied with such illustrative specimens as are essential for the teacher's purposes. Confining myself to the consideration of provincial and local museums and their requirements for educational purposes, each should contain a series of specimens illustrating the principal and some of the lesser divisions of the animal and vegetable kingdoms, so disposed in well-lighted cases as that an inquiring observer might learn therefrom the principles upon which animals and plants are classified, the relations of their organs to one another and to those of their allies, the functions of those organs, and other matters relating to their habits, uses, and place in the economy of nature. Such an arrangement has not been carried out in any museum known to me, though partially attained in that of Ipswich; it requires some space, many pictorial illustrations, magnified views of the smaller organs and their structure, and copious legible descriptive labels; and it should not contain a single specimen more than is wanted. The other requirements of a provincial museum are—complete collections of the plants and animals of the province, which should be kept entirely apart from the instructional series, and from everything else. The curator of the museum should be able to give elementary demonstrations (not lectures, and quite apart from any powers of lecturing that he may possess) upon this classified series, to schools and others, for which a fee should be charged and go to the support of the institution. And the museum might be available (under similar conditions of payment) for lectures and other demonstrations. . . . . .

In respect of its natural history collections the position of the British Museum appears to me to be a disadvantageous one; it is surrounded by miles of streets, including some of the principal metropolitan thoroughfares, which pour clouds of dust and the products of coal combustion into its area day and night; and I know few more disappointing sights, to me, than its badly-lit interior presents on a hot and crowded public holiday, when whole families from London and its outskirts flock to the building. Then young and old may be seen gasping for fresh air in its galleries, with no alternative but the hotter and dustier streets to resort to. How different it would be were these collections removed to the townward end of one of the great parks! where spacious and well-lit galleries could be built, among trees, grass, and fountains; and where whole families need not any more be cooped up for the day in the building, but avail themselves of the fresh air and its accessories at the same time as they profit by the collection! . . . . . .

The greatest botanical discoveries made during the last ten years have been physiological, and I here allude especially to the series of papers on the fertilisation of plants, which we owe to Mr. Darwin. You are aware that this distinguished naturalist, after accumulating stores of facts in geology and zoology during his circumnavigation of the globe with Captain Fitzroy, espoused the doctrine of the continuous evolution of life, and by applying to it the principles of natural selection, evolved his theory of the origin of species. Instead of publishing these views as soon as conceived, he devoted 20 more years to further observation, study, and experiment, with the view of maturing or subverting them. Mr. Darwin's recent two volumes "On Animals and Plants under Domestication," is a catacomb of data, observations, and experiments, such as assuredly no one but himself could produce. It is hard to say whether it is most remarkable for the number and value of the new facts it discloses, or for its array of small, forgotten, or overlooked observations, neglected by some naturalists, and discarded by others, which, under his mind and eye, prove to be of first-rate scientific importance. An eminent surgeon and physiologist (Mr. James Paget) has remarked to me *apropos* of these volumes, that they exemplify, in a most remarkable manner, that power of utilising the waste materials of other scientific men's laboratories which is a very characteristic feature of their author. As one of those *pièces justificatifs* of his previous work, "The Origin of Species," which have been waited for so long and impatiently, these volumes will probably have more than their due influence; for the serried ranks of facts in support of his theories which they present may well awe many a timid naturalist into bolting more obnoxious doctrines than that of natural selection. It is in this work that Mr. Darwin expounds his new hypothesis of pangenesis, which certainly correlates to, and may prove to contain the rationale of all the phenomena of reproduction and inheritance. You are aware that every plant or animal commences its more or less independent life as a single cell from which is developed an organism more or less closely similar to its parents. One of the most striking examples I can think of is afforded by a species of begonia, the stalks, leaves, and other parts of which are superficially studded with loosely attached cells. Any one of these cells, if referred to favourable conditions, will produce a perfect plant, similar to its parent. You may say that these cells have inherited the potentiality to do so, but this is not all, for every plant thus produced in like manner develops on its stalks and leaves myriads of similar cells, endowed with the same property of becoming such in new plants; and so on, apparently interminably. Therefore the original cell that left the grandparent, not only carried with it this so-called potentiality, but multiplied it and distributed it with undiminished power through the other cells of the plant itself produced; and so on for countless generations. What is this potentiality, and how is this power to reproduce thus propagated, so that an organism can, by single cells, multiply itself so rapidly, and within very narrow limits, so surely and so interminably? Mr. Darwin suggests an explanation, by assuming that each cell or fragment of a plant (or animal) contains myriads of atoms or geminules, each of which geminule he supposes to have been thrown off from the separate cells of the mother plant, the geminules having the power of multiplication, and of circulating throughout the plant: their future development he supposes to depend on their affinity for other partially-developed cells in due order of succession. Geminules which do not become developed, may, according to his hypothesis, be transmitted through many succeeding generations, thus enabling us to understand many remarkable cases of reversion or atavism. Thus, according to this hypothesis, not only have the normal organs of the body, the representative elements of which they consist diffused through all the other parts of the body, but the morbid states of these, as hereditary diseases, malformations, &c., all actually circulate in the body as morbid geminules. Ten years have elapsed since the publication of the "Origin of Species by Natural Selection," and it is hence not too early now to ask what progress that bold theory has made in scientific estimation. The most widely circulated of the journals that give science a prominent place on their title pages, the *Athenæum*, has, very recently, told it to every country where the English language is read, that Mr. Darwin's theory is a thing of the past; that natural selection is rapidly declining in scientific favour, and that, as regards the above two volumes on the variation of animals and plants under domestication, they "contain nothing more in support of origin by selection than a more detailed reassertion of his guesses founded on the so-called variations of pigeons." Let us examine for ourselves into the truth of these inconsiderate statements. Since the "Origin" appeared, ten years ago, it has passed through four English editions, two American, two German, two

French, several Russian, a Dutch, and an Italian; whilst of the work, on variation, which first left the publisher's house not seven months ago, two English, a German, Russian, American, and Italian edition are already in circulation. So far from natural selection being a thing of the past, it is an accepted doctrine with every philosophical naturalist, including, it will always be understood, a considerable proportion who are not prepared to admit that it accounts for all Mr. Darwin assigns to it. Reviews on the "Origin of Species" are still pouring in from the Continent, and Agassiz, in one of the addresses which he issued to his collaborateurs on their late voyage to the Amazons, directs their attention to this theory as a primary object of the expedition they were then undertaking. I need only add, that of the many eminent naturalists who have accepted it, not one has been known to abandon it; that it gains adherents steadily; and that it is *par excellence* an avowed favourite with the rising school of naturalists; perhaps, indeed, too much so, for the young are apt to accept such theories as articles of faith, and the creed of the student is also too likely to become the shibboleth of the future professor. On the score of geology, the objectors rely chiefly on the assumed perfection of the geological record; and since almost all who believe in its imperfection, and many of the other school, accept the theories both of evolution and natural selection, wholly or in part, there is no doubt but Mr. Darwin claims the great majority of geologists. The veteran Sir Charles Lyell, after having devoted whole chapters of the first edition of his "Principles" to establishing the doctrine of special creations, abandons it in the tenth, and this, too, on the showing of a pupil; for, in the dedication of his earliest work, "The Naturalist's Voyage," to Sir C. Lyell, Mr. Darwin states that the chief part of whatever merit himself or his works possess has been derived from studying the "Principles of Geology." I know no brighter example of heroism of its kind, than this, of an author thus abandoning, late in life, a theory which he had for forty years regarded as the very foundation of a work that had given him the highest position attainable among scientific writers. Well may he be proud of a superstructure raised on the foundations of an insecure doctrine, when he finds that he can underpin it, substitute a new foundation, and after all is finished, survey his edifice, not any more secure, but more harmonious in its proportions, than it was before; for assuredly the biological chapters of the tenth edition of the "Principles" are more in harmony with the doctrine of slow changes in the history of our planet, than were their counterparts in the former editions.

. . . . A new science has dawned upon us, that is the early history of mankind. Prehistoric archæology (including, as it does, the origin of language and of art), is the latest to rise of a series of luminaries that have dispelled the mists of ages and replaced time-honoured traditions by scientific truths. Astronomy, if not the queen, yet the earliest of sciences, first snatched the torch from the hands of dogmatic teachers, tore up the letter, and cherished the spirit of the law. Geology next followed, but not for two centuries, nor indeed till this our day, did it succeed in divesting religious teaching of many cobwebs of scientific error. It has told us that animal and vegetable life preceded the appearance of man on the globe, not by days but by myriads of years; and how late this knowledge came we may gather from the fact that Mr. Lawrence, in his lectures delivered so late as 1818, says of the extinct races of animals, that "their living existence has been supposed, with considerable probability, to be of older date than the formation of the human race." And last of all, this new science proclaims man himself to have inhabited this earth for, perhaps, many thousands of years before the historic period—a result little expected less than 30 years ago, when the Rev. W. V. Harcourt, in his address to the association at Birmingham, observes that "geology points to the conclusion that the time during which mankind existed on the globe cannot materially differ from that assigned by Scripture," referring, I need not say, to the so-called Scripture chronology, which has no warrant in the Old Testament, and which gives 5874 years as the age of the inhabited globe. Pre-historic archæology now offers to lead us where man has hitherto not ventured to tread. Can we, whilst pursuing this inquiry, separate its physical from its spiritual aspect? will be the uppermost thought in the minds of many here present. To separate them, I believe, is indeed impossible, but to search out common truths that underlie both is permitted to all. It has been well said of all truth, by Mr Disraeli, that "It is the sovereign passion of mankind," and it should be emphatically so in the minds engaged in this search, where religion and science should speak peace to one another, if they are to walk hand in hand in this day and generation. A great deal has been said and written of late about the respective attitudes of religion and science, and my predecessor, the Duke of Buccleuch, dwelt on this in his address last year with great good sense and good taste, and pointed out how much the progress of knowledge depended on this attitude being mutually considerate and friendly. During the first decades of my scientific life, the word "science" was rarely within my experience heard in the pulpits of these islands. During the succeeding, when the influence of the *Reliquiæ Diluvianæ*, and the *Bridgewater Treatises* was still felt, I often heard it, and always welcomed it. Now of late years, science is more frequently named than ever, but too often with dislike or fear, rather than with trust and welcome. . . . . .

Let each pursue the search for truth, the archæologist into the physical, the religious teacher into the spiritual history and condition of mankind. It will be in vain that each regards the other's pursuits from afar, and turning the object glass of his mind's telescope to his eye is content when he sees how small the other looks. To search out the whence and whither of existence is an unquenchable instinct of the human mind; to satisfy it man in every age and in every country has adopted creeds that embrace the history of his past and future, and as eagerly accepted scientific truths that support the creeds, and, but for this unquenchable instinct, I firmly believe that neither religion nor science would have advanced so far as they have in the estimation of any people. Science has never in this search hindered the religious aspirations of good and earnest men; nor have pulpit cautions, which are but ill-disguised deterrents, ever turned inquiring minds from the revelations of science. A sea of time spreads its waters between that period to which the earliest traditions of our ancestors point, and that far earlier period when man first appeared upon the globe. For his track upon the sea man vainly questions his spiritual teachers. Along its hither shore, if not across it, science now offers to pilot him. Each fresh discovery concerning prehistoric man is as a pier built on some rock its tide has exposed, and from these piers will one day spring arches that will carry him further over its deeps. Science, it is true, may never sound the depths of that sea, may never buoy its shallows, or span its narrowest creeks; but she will still build on every tide-washed rock; nor will she ever deem her mission fulfilled till she has sounded its profoundest depths and reached its further shore, or proved the one to be unfathomable and the other unattainable upon evidence not yet revealed to mankind. And if in this track one bears in mind that it is a common object of religion and science to seek to understand the infancy of his existence, that the laws of mind are not relegated to the teachers of physical science, and that the laws of matter are not within the religious teacher's province, these may then work together in harmony and goodwill. But if they would thus work in harmony both parties must beware how they fence with that most dangerous of all edged weapons, natural theology—a science falsely so called—when, not content with trustfully accepting truths hostile to any presumptive standard it may set up, it seeks

to weigh the infinite in the balance of the finite, and shifts its ground to meet the requirements of every new fact that science establishes and every old error that science exposes. Thus pursued, natural theology is to the scientific man a delusion, and to the religious man a snare, leading too often to distorted intellects and to atheism. One of our deepest thinkers, Mr. Herbert Spencer, has said:—"If religion and science are to be reconciled, the basis of the reconciliation must be this deepest, widest, and most certain of facts, that the power which the universe manifests to us is utterly inscrutable." The bond that unites the physical and spiritual history of man, and the forces which manifest themselves in the alternate victories of mind and of matter over the actions of the individual are, of all the subjects that physics and psychology have revealed to us, the most absorbing and perhaps inscrutable. In the investigation of these phenomena are wrapped up the past and the future, the whence and the whither of his existence; and after a knowledge of these the human soul still yearns, and thus passionately cries, in the words of a living poet:—

"To matter or to force
The All is not confined;
Beside the law of things
Is set the law of mind;
One speaks in rock and star,
And one within the brain,
In unison at times
And then apart again;
And both in one have wrought us hither
That we may know our whence and whither.

The sequency of law
We learn through mind alone,
We see but outward forms,
The soul the one thing known:
If she speak truth at all,
The voices must be true
That give these visible things,
These laws, their honour due;
But tell of one who brought us hither,
And holds the keys of whence and whither.

* * * * *

He in his science plans
What no known laws foretell;
The wand'ring fires and fix'd
Alike are miracle:
The common death of all,
The life renew'd above,
Are both within the scheme
Of that all-circling love;
The seeming chance that cast us hither
Accomplishes his whence and whither."

Dr. Hooker resumed his seat amid loud cheers, and a cordial vote of thanks for his address was moved by Professor Huxley, seconded by Professor Tyndall, and supported by the Mayor of Norwich, who heartily welcomed the Association to Norwich.

REGULATIONS RESPECTING FISHING IN FRANCE.

An important document on fishing, by the Minister of Agriculture and Commerce, has recently appeared, accompanied by an Imperial decree upon the subject.

A law, passed in 1865, introduced four new and important provisions into the legislation in France on this subject, namely, the creation of reserves for the reproduction of the fish, the establishment of ladders in the weirs, in order to assist the return of migratory fish, the reducing to a uniform scale the restrictions relating to the fishing-seasons in those parts of the rivers which are near the sea, and the interdiction of the sale, hawking, import and export of the several kinds during the periods of prohibition. These provisions have, it would appear, only been partially carried out. Surveys have been made with the view to the formation of reserves; the establishment of one of these reserves in the basin of the Seine has been decreed, and other decrees are promised respecting the basins of the Loire, the Garonne, and the Rhone. Ladders have been formed in the weirs of the Moselle, Dordogne, Vienne, Blavet, and other rivers, and others will be constructed as rapidly as the means at the disposal of the service will allow. Lastly, the interdiction against salmon and trout fishing has been fixed uniformly for the whole of the rivers of the empire, whether fluvial or maritime. The period of interdiction is from the 20th of October to the 31st of January in each year.

Under the authority of old ordonnances each department had its own river regulations and police enactments, and, consequently, there existed a great diversity in various places, not only with respect to the periods of interdiction, but also as to nets and tackle to be used, and other matters; and it has been determined to put an end to this condition of affairs, and to adopt the same regulations for all the watercourses of the empire, with some necessary exceptions. The uniformity of the regulations respecting the size of the meshes of nets, the tackle, and modes of taking fish, and the size below which this or that fish shall be thrown back into the water, cannot give rise to any serious objection; the only point which is likely to give rise to discussion is the period of interdiction with respect to the various kinds of fish. Uniformity in regulation would clash with the natural laws of reproduction, which vary with the climate and species; still, it appears that, as regards all the fish that live in the waters of France, a classification is desirable, corresponding with two distinct periods of spawning, that of winter for the salmonidæ, and of summer for the other species, an average interval being fixed, so as sufficiently to protect the earliest as well as the latest fry. A scheme founded on these bases was communicated to the Conseils-Généraux in 1865, and examined by them during the following year. The results were afterwards laid before a commission appointed by the Minister of Agriculture, and finally the subject was examined by the Agricultural and Industrial Section of the Conseil d'Etat.

The following are the clauses of the decree in question:—

Article 1. The taking of salmon, trout, and char is interdicted between the 20th October and the 31st of January, and that of all other kinds of fish, as well as of river crawfish, between the 15th of April and the 15th of June. The grayling, eel, and lamprey are included in these interdictions, but not other kinds which live alternately in fresh and salt water. The interdiction applies to all methods of taking fish, even by hook and line.

Art. 2. The prefects are authorised, with the advice of the Conseils-Généraux, to interdict the taking of any species of fish during either of the above-mentioned periods, in order to protect the most important kinds; but such interdiction must be submitted to the approbation of the Minister of Agriculture.

Art. 3. All interdictions must be published during the week preceding the date when they come into force.

Art. 4. Any persons carrying or selling fish caught in reservoirs or pools during the interdicted periods may be called upon to prove their origin.

Art. 5. No fish seized and sold under this decree can be again offered for sale.

Art. 6. Fishing is only permitted between sunrise and sunset. But the taking of craw-fish and eel may be authorised at other hours, may be allowed by the order of a prefect, which order must, in the case of craw-fish, mention the nature and dimensions of the nets or apparatus to be used.

Art. 7. Nets and apparatus of the legal dimensions may be left in the water at any time, but they must not be laid or lifted except during daylight.

Art. 8. Fish of smaller size than those mentioned below must not be taken, or, if taken, must be immediately thrown back into the water:—1. Salmon and eels, 25 centimetres long (10 inches). 2. Trout, char, grayling, carp, pike, barbel, bream, chub, mullet, chad, perch, roach, tench, eel-pouts, and lampreys, 14 centimetres (5½ inches). 3. Soles,

flounders, and plaice, 10 centimetres (4 inches). 4. Craw-fish, 8 centimetres (3⅛ inches).

The length of the above-mentioned fish are to be measured from the eye to the root of the tail, and that of the craw-fish from the eye to tip of the tail when stretched out. These rules do not, however, apply to fish taken by anglers.

Art. 9. The meshes of nets, measured each way after having remained in water, and the openings of eel-pots, traps and other apparatus used in fishing, must have the following dimensions:—1. For salmon, at least 40 millimetres (rather more than 1 9/16 inches). 2. For the larger fish, salmon excepted, and for craw-fish, at least 27 millimetres (1 1/16 inch). 3. For the small kinds, such as gudgeons, loach, minnows, bleak, and others, 10 millimetres (rather more than ¾ inch). An allowance of one-tenth is made with respect to the meshes.

Art. 10. Nets, whether fixed or floating, must not exceed in length more than two-thirds of the width of the streams in which they are used; and a number of nets must not be used, whether on the same side or different sides of a stream, without a space equal at least to three times their own length.

Art. 11. Fixed nets must be raised by the middle during thirty-six hours in each week, namely, from six o'clock on Saturday night to six in the morning of Monday, along at least one-tenth of their whole length, in such a manner as to leave at least half-a-yard clear between the lower edge of the net and the bottom of the stream.

Art. 12. All drag nets are prohibited with the exception of the *epervier*, managed by a single man. All snares are also prohibited.

Art. 13. It is prohibited also:—1. To fix any apparatus whatever in streams, so as to drive the fish into holes, whence they cannot escape, or compel them to pass through openings protected by snares or traps. 2. To fix baskets, nets, or traps against sluices, weirs, natural falls, mill-streams, or fish-ladders. 3. To fish with any tackle or apparatus, except hand rod and line, within sluices, gates, mill-streams, and fish passages or ladders, or within thirty mètres of such works or places. 4. To fish in those parts of rivers, canals, or streams, which have been accidentally reduced, either for cleansing operations or by the stoppage of works, &c.

Art. 14. Prefects are empowered, on the application of inspectors of fisheries and waterways, or of proprietors of streams, to permit, at certain times, and within certain defined limits, extraordinary means to be taken, with a view to the destruction of certain species of fish and the introduction of others of more value.

Art. 15. Prefects are empowered, with the advice of engineers and sanitary councils, to fix:—1. The duration of the steeping hemp and flax in watercourses, and to fix the localities where such steeping may be carried on with the least inconvenience as regards the fish. 2. The measures to be observed with respect to waste matters from factories and other sources, and the healthiness of fish streams.

The above regulations do not apply to the Rhine or the Bidassoa, for which there are special laws and regulations.

SOUTH STAFFORDSHIRE INDUSTRIAL AND FINE ARTS EXHIBITION.

It has been determined to hold, during the spring and summer of 1869, at Wolverhampton, an Industrial and Fine Arts Exhibition, under the auspices of the committees and supporters of the Wolverhampton School of Practical Art, and of the South Staffordshire Educational Association.

In a circular recently issued, the promoters of the undertaking say:—

"The great importance and variety of the manufactured productions of South Staffordshire, and of those portions of East Worcestershire immediately adjacent thereto, have never yet been fully realized in any exhibition, either international or local; and the proposal now made to supply this manifest defect, by a complete and strictly local exposition of the manufactured products of the entire district, after a well-arranged classification, and on a scale commensurate with its resources, cannot fail to ensure for it a deep and wide-spread interest.

"The chief objects, therefore, of the exhibition will be, to illustrate, as fully as possible, the entire natural and industrial resources and productions of the district; to collect and arrange the best obtainable specimens of ancient and modern articles, whether of home or foreign manufacture, with a view to the suggestion of useful comparisons; to stimulate the inventive faculties and the manual skill of artisans and designers; to exhibit all the best plans and designs for the applications of science and ingenuity to the working of mines, the erection and improvement of workmen's houses, of workshops, and of public buildings; and to give such a direction to the taste and general education of the locality as the exhibition of choice works of art is always so well calculated to impart.

"The exhibition will consist of an indoor and an out-door department, and will necessitate either the erection of a set of temporary annexes, in connection with some present building in the town, as, for example, the School of Art; or, in the event of the space required being too great for this site, the erection of a number of suitable sheds, on a good site, readily accessible both from the town and the district generally.

"To secure the committee from even an apprehension of ultimate loss, it is intended to establish a guarantee fund, and in order to produce as wide an interest in the undertaking as possible, it has been determined to limit each guarantor's liability to the sum of £10. It is proposed that the minimum guarantee fund shall be at least £2,000. A private canvass, conducted by two or three members of the committee, has secured already a full fourth of this amount.

"The committee have already received the most gratifying promises of help from several of the noblemen, gentlemen, and leading manufacturers of this portion of the county. From South Kensington, too, they have every expectation of the loan of a large and valuable collection of metal and other works of art, both ancient and modern, and it is with the greatest satisfaction that they are able to announce that Mr. Geo. Wallis, formerly of Wolverhampton, but now of the South Kensington Museum, has, in the kindest manner, promised to meet the committee with reference to their proposed arrangements for this exhibition, and to afford them all the advice and help which his long experience so well qualifies him to impart. It is intended to open and close the exhibition with a public ceremonial and grand musical entertainments.

"The question of awarding distinctions and rewards to manufacturers has not yet been fully entertained by the committee. It is a nice question, and one which it is important that manufacturers should themselves settle. Those, therefore, who intend exhibiting, are requested to give their opinion upon the matter. Reports by thoroughly competent men, upon the various classes of objects exhibited, will be prepared and published, under the superintendence of a special committee, as soon as possible after the close of the exhibition. Any surplus proceeds of the exhibition are to be divided between the two bodies named in the first paragraph."

The Earl of Lichfield is President; Messrs. Henry T. Barker, of Wolverhampton, and George T. Hartley, of the Oaks, Wolverhampton, are the Honorary Secretaries; and Mr. Fredk. Talbot, of Smethwick, visiting officer to the Society of Arts in the South Staffordshire district, is the Secretary, *pro tem.*"

It is intended that the exhibition should include—

1. A complete collection of the natural productions of the district.

2. A complete collection of the best examples of all articles produced in the district, classified and arranged, as far as possible, with regard to the expense and skill required in their production.

3. A loan collection from South Kensington, and from noblemen and gentlemen interested in the exhibition, of the best examples of home and foreign productions, either ancient or modern, similar to those produced in the district, and calculated to suggest any improvement in, or the extension of, any process or manufacture.

4. A collection of designs, models, or articles, produced by designers, modellers, artisans, and workmen, upon certain specified conditions, and after prescribed models.*

5. A collection of implements, tools, and machines, used in the manufacturing and mining operations of the district.

6. A collection of designs and plans for industrial establishments; for the working and ventilation of mines; for public buildings, such as town halls, markets, institutes, and schools; for groups of workmen's houses; for utilising waste lands, such as pit banks, and slag heaps; for draining and sewage purposes; geological models, sections, and maps, of the whole, or of any portions of the district.

7. An educational collection of work done by pupils of schools of art and night schools, such as drawings and designs, maps, specimens of writing and accounts, needlework, knitting, and such other productions as are suggested in the broad sheet of the South Staffordshire Educational Association, as proper to be done by apprentices and other young persons attending the night schools of the district.

8. An art gallery, consisting of illustrations of the fine arts, pictures, statues, busts, vases, portraits of men eminent in connection with the history, and especially with the history of the manufactures, of the county; with photographic illustrations, scientific and philosophical apparatus, &c.

9. Machinery in motion.

10. An out-door exhibition of grottoes, fountains, aquariums, hydraulic machines, conservatories, flowers, ferns, plants, &c.

Fine Arts.

Distribution of Fine Art Prizes in Paris.—The distribution of the awards made to artists who exhibited in the *salon* of the present year, and to the pupils of the Ecole des Beaux Arts took place in the great square room of the Louvre, with the accustomed ceremony, on the 13th inst. The meeting was presided over by Marshal Vaillant, Minister of the Imperial Household and of the Fine Arts, supported by the Count de Nieuwerkerke, Superintendent, and other officers of the department, and a large number of members of the Institute, conservators of the public collections, and artists. The main fact referred to in connexion with the late *salon* was the absence of any historical work of sufficient importance to warrant the award of the great prize in painting, which was given to a work of *genre*, as stated in a notice of the *salon* in the *Journal*. While highly applauding the value and the progress which has recently taken place in the character of such works of late years, the Minister laid great stress on the maintenance of a higher standard by the representation of great ideas on a large scale. Nine Crosses of the Legion of Honour were awarded by the Emperor, the recipients being Messieurs Nanteuil, Brisset, Anastasi, and Millet, painters; Cabet and Daumas, sculptors; and Laurens, lithographer; with two foreign painters, Verlat and Pasini. It was announced that presentations of pictures, either ordered specially, or purchased out of the funds of the Department of the Beaux Arts, had been made to churches and chapels in sixty-three departments of France, and that portraits, full or half-length, engraved portraits and busts of the Emperor and Empress, had been presented to seventy prefectures, hôtels de ville, and colonial government-houses.

Monument to Ibrahim Pacha.—The present Viceroy of Egypt has ordered a magnificent monument, fifty feet high, to be erected to the memory of his father. At the foot of a statue of the late viceroy will be four lions *couchant*, the pedestal to be ornamented with bas-reliefs in marble and bronze, and around the base will be a basin receiving ten jets of water. The commission entrusted with the arrangements consists of the Count de Nieuwerkerke, Messieurs Théophile Gautier, Paul de Saint Victor Gérôme, Muller, Charles Edmond, and Nubar Pacha. The execution of the work is entrusted to M. Thobais, architect; M. Charles Cordier, sculptor; and M. Jacquemart, modeller of animals. In spite of the protests issued against the junction of monumental statues and fountains, here we have another example of the practice.

Decorations of the New Vaudeville Theatre, Paris.—The new Vaudeville Theatre presents but a small front, only a large rounded angle of the Boulevard and the Chaussé d'Antin, but it is highly decorated. M. H. Chevalier has executed the sculpture of the pediment, which represents the "Genius of Comedy," supported by two smaller genii, with the attributes of modern comedy. M. Salmson has carved four fine caryatides, representing "Satire," "Poetry," "the Dance," and "Comedy." M. E. Hébert, two groups of children, representing "Music" and "Comedy." And in addition to these are three busts, representing Désaugiers, Collé, and Scribe, executed by M. Evrard and Mdlle. Dubois Davesnes. The interior of the theatre is being rapidly completed, and will be ready for performances in a few months.

Manufactures.

Manufactures in California.—Two large woollen mills have been in successful operation for several years; one of them has recently added works for the manufacture of all kinds of knit goods. A cotton mill, erected some two years since, has been gradually extending its business, and now manufactures 30,000 yards of shirting monthly. Last year the produce amounted to 100,000 yards of shirtings and 50,000 of brown sheeting. A small portion of the cotton used is drawn from the southern portion of the state. The California Powder Company last year manufactured 153,000 kegs of blasting and 7,300 kegs of fine powder. All the machinery required on the coast is manufactured in San Francisco and other parts of the state. A cordage factory turned out, in 1867, 2,000,000 lbs. of cordage, and manufactures the largest-sized hawsers. A wire-rope factory is doing a large business, and the proprietors have erected several suspension-bridges in the state, in a most creditable manner. Several potteries have been established within the past two or three years, and work with clay of a superior quality, found in several parts of the state. There are twelve soap factories in the city of San Francisco and neighbourhood, manufacturing the common qualities to an extent to supply the entire requirements of the northern coast. Almost every branch of manufacturing industry is represented there, and in a few years no manufactured articles of any kind whatever will be required from the Eastern States of America.

Utilisation of Water-Power.—An application has been made to the Minister of Agriculture, by an Italian engineer, Signor A. Vescovali, for permission to make

* A prize-scheme in connexion with this portion of the exhibition will, it is hoped, be forthcoming with the publication of the conditions. The committee will be very happy to receive offers of prizes from manufacturers, public bodies, or gentlemen who may feel an interest in this portion of the scheme, and also suggestions as to the kinds of articles upon the production of which the artisans of the district may be most usefully encouraged to apply their talents and leisure.

use of the water-power furnished by the waterfall of the Marmore, near Terni (Italy), by means of Hirn's system of telodynamic transmission. This system, which was exhibited at the Paris Exhibition, 1862, consists in conveying the power obtained by a water-wheel or other hydraulic motor, to any place where it may be required, by means of an endless wire rope carried on pullies. Since 1850 this system has been adopted in various parts of Europe, amongst which may be mentioned at Kaiserberg, in Alsatia, where the power is transmitted to a distance of 342 meters; at Oberursel, near Frankfort, to 984 meters; in Denmark to 1,100 meters; at Cornimont (Vosges), to 1,150 meters; at Emmendingen, to 1,200 meters; at Okhta (Russia), to 1,400 meters; and to 1,500 meters at Fontaine-La-Soret (Eure). Among the most recent applications of this system may be mentioned those of Schaffhausen (Switzerland), and Fahm (Sweden). At the first the power (obtained from an artificial fall in the Rhine) is conveyed to a distance of 1,200 meters and serves to work the machinery of several large cotton mills, a gun factory, goldsmiths' works, saw-mills, &c. At the latter place the possibility of conveying motive-power to a greater distance is practically demonstrated, the power obtained from a waterfall being conveyed to a distance of 5 kilometers to the mines of Fahm. This system Signor Vescovali proposes to adopt to supply the various industries in the Piano di Terni with an economical motive-power. The locality seems to be admirably adapted for this purpose, and by making use of the falls of the Velino, at the Marmore, which is 160 meters in height, with a minimum discharge of 40 cubic meters per second, a motive power of about 85,000 horse-power might be obtained.

PANAMA HATS.—The hats of Guayaquil, so very generally used and appreciated now in Europe, as they have long been in America, and known under the misnomer of Panama hats, because they are shipped through Panama, are made with the split fibre of the leaves of a plant belonging to the family of *Cyclanthus*, locally called *Bombonaxa Chidra*, &c., but known to botanists as the *Carludovico palmata*. These hats are somewhat dear, but very durable; and as they can be cleaned and bleached at a small expense, they preserve to the last the supple qualities and beauty which they had when they left the workman's hands. They are in general use in America by all classes, and on the Continent the drivers of vehicles have begun to estimate and appreciate them. Their price varies from 2s. or 3s. up to £25, according to fineness. In Europe they necessarily cost more. The finest are made with the fibre of the young unexpanded leaf, called *Toquilla*, from which is also made very fine hammocks, which are as much sought after as the hats. Lately the leaves or raw material has been in demand for export, the average quantity shipped being about 200 to 250 cwt. annually. The average export from Guayaquil alone of these so-called Panama hats has been in the past six years from 15 to 16 thousand dozens annually. There are also about 150 to 200 hammocks shipped yearly. These hats are also made in the State of Costa Rica, and in New Granada, where the palm leaf fibre is called *Murrapa*, and the split leaf *Nacuma*. The very fine hats made in this State rival those of Guayaquil. The principal places where they are made in New Granada are the provinces of Antioquia, Nina, and Socorro. The petioles of the leaf are made here into baskets, called Petacas. The fibre is dyed various colours.

Commerce.

AMBER.—The dredging establishment near Schwarzort, on the Curish Haff, produced about 83,600 lbs. of amber in the course of the year 1867. In the two previous years the quantities obtained were as follows, viz.:—in 1865, 53,000 lbs.; and in 1866, 73,000 lbs. The amber trade during the year was not very flourishing. The expectation that the business with England would become more important has not been fulfilled. It is most probable that the large quantities of imitated amber which are brought to the English and Asiatic markets, and the price of which is much lower than that of the genuine article, causes the demand from Prussia to be so small.

TEA CULTIVATION IN INDIA.—The *Pioneer*, an Allahabad paper, summarising the report of the Commissioners appointed to inquire into the present condition and future prospects of tea cultivation in Assam, Cachar, and Sylhet, says:—"On the whole the Commissioners do ample justice to the planters, and bear testimony to the kindness and consideration with which the labourers are treated on the great majority of tea estates. They condemn the working of the system of supplying Coolie labour to the gardens through the intervention of contractors, or middle men, who have no interest in common with the planter or the Coolie, and who invariably cheat both. The protectorate system is also condemned as useless and inoperative, and supervision by medical officers recommended in its stead. The commissioners hold also that planters have been unjustly dealt with by the Public Works Department, who have employed largely the time-expired labourers who were originally imported into the districts, at immense cost, by the planters; and they recommend that government should follow the example of the tea planters, and import Coolie labour sufficient to meet the requirements of the service on public works. The question of successful cultivation, the commissioners think, may be reduced to one of labour. They see no reason to doubt that, so far as soil and climate go, tea can be grown profitably. If labour can be obtained in sufficient quantity, and at reasonable cost, and the gardens be properly and economically managed, the cultivation of the plant may, they feel confident, be carried on at a profit. The most interesting part of the report, however, is that which relates to the mortality of the Coolies in the depôts, and in transit to the tea districts; and a horrible picture it presents to our view. Compared with the death-rate among Coolies shipped at the different colonies which import Indian labourers, the death-rate of the Coolies for the tea districts in the Calcutta depôts is as 59·02 to 11·58. The reason for this vast discrepancy is attributed to the very much larger proportion of Dhangurs (the hill people of Chota Nagpore), who are recruited for the tea plantations. It has long been an admitted fact, that these people suffer much more severely, both in the depôts and on the voyage, than other Coolies, and that they die in much larger numbers. At the Mauritius depôt, from May 1st, 1860, to April 30th, 1861, the death-rate among these hill people was 141·6 per cent. per annum. In other words their average tenure of life in Calcutta was only eight months. No wonder that the commissioners, with this frightful fact before them, should have recommended the government not to allow any more Dhangurs to be recruited for the tea districts. This brings us once more to the question of the labour supply, upon which depends the future successful cultivation of Indian tea. The commissioners (wisely, we think) recommend that planters should be encouraged to send their own garden sirdars to beat up for recruits, in the districts from which they are imported; and that parties of Coolies, not exceeding fifty in each, should be permitted to make their own way to the gardens. In this way, the expense of imported labour would be much less than under the present system; there would be less danger of epidemic disease breaking out among the Coolies on the journey; the Calcutta depôts, and the over-crowding there, would be avoided altogether; and the relations between the employers and the employed would be much strengthened."

LINE OF STEAMERS BETWEEN GENOA AND EGYPT.—A regular steam service between Genoa and Alexandria has just been established by Messrs. Rubattino and Co.

of Genoa, the owners of the Italian mail packets. The *Africa* screw steamer, of 1,200 tons, the first of the new line, sailed from Genoa on the 16th of July, for Alexandria and Port Said. The departures from Genoa are fixed for the 1st and 16th of each month.

EXPORTS FROM SWITZERLAND TO THE UNITED STATES.—In 1867 there was a considerable decrease in the exports from Switzerland to the United States as compared with those of the previous year, the falling off principally being in silks and watches. The following are the values of the principal exports in 1866 and 1867:—

	1866.	1867.
	Francs.	Francs.
Silk, stuffs, and ribbons	31,766,072	18,818,073
Cotton goods	5,173,296	2,038,330
Lace	3,236,138	3,154,087
Straw manufactures	1,179,705	2,432,405
Watches and parts of watches..	13,093,408	10,362,418
Musical boxes	300,108	265,196
Cheese.....	700,130	827,647
Leather	1,098,541	1,205,428

IMPORTS OF SULPHUR TO VENICE.—The following are the imports of sulphur to Venice in 1867 compared with those of the four previous years:—

	Quintals.	Value.
		frs.
From Sicily.....	25,639	435,863
„ Umbria	23,221	394,767
„ France	1,127	19,159
„ Austria	4,921	83,657
Total in 1867	54,908	933,436
„ 1866	14,762	243,556
„ 1865	26,980	472,157
„ 1864	30,933	618,660
„ 1863	31,600	632,010

Colonies.

THE ISLAND OF GRENADA.—The following account of the condition of this island is quoted by the *Produce Markets' Review*, from a Government report:—"There are 140 estates in cultivation, namely, 72 in sugar, 56 in cocoa, and 12 in cotton. The quantity of sugar shipped during the last five years is as follows:—

	Tons.	cwt.	qrs.	lbs.
1862	3,475	11	3	14
1863	5,116	16	0	12
1864	4,492	15	0	15
1865	3,928	0	2	24
1866	5,360	14	1	14

The sugar crop of 1866 is in excess of that manufactured in any of the years embraced in the above return, and is considerably over the annual average of the last twenty years. The prospects of the sugar planters are not, however, very encouraging, and there is every reason for apprehending that a large extent of land will shortly be thrown out of cane cultivation. There are no less than 14 sugar plantations at this present moment advertised for sale in the local newspaper; although in Grenada the negro is undoubtedly averse to work continually in the cane fields, yet, the despondency which now prevails among some of the proprietors of sugar plantations cannot be attributed to the want of a sufficient supply of labour; no less than 4,197 immigrants have been introduced into the colony since the year 1843, and, if we are to judge by the refusal of so many of the planters to re-indenture the coolies located on their estates after the completion of their industrial service of five years, we may conclude that at present the supply of labour is more than equal to the demand. The colony has now a much greater population than it ever had since the cession in 1762. In 1776, with a slave population of 48,923, the island shipped 10,400 tons of sugar, 41 tons of cotton, 815 tons of coffee, 12 tons of indigo, and 204 tons of cocoa. In 1787, with a slave population of 23,906, the shipments were 8,772 tons of sugar, 400 tons of coffee, and 921 tons of cotton. In 1828, with a slave population of 24,342, the exports were 20,172 hogsheads of sugar. And in 1831, with a population of 23,604, the exports were 11,901 hogsheads. The cost of making sugar is heavier, I believe, in Grenada than in most of the other British colonies, and the sugar produced is generally of a very inferior quality, and obtains the lowest price in the British market. Grenada, it would seem, from these circumstances, has not kept pace with her sister colonies in the improvements which of late years have been effected in nearly all of them, in the former system of cultivation and manufacture. On most of the estates the crop of 1866 was produced at a heavy pecuniary loss to the planter. From some accounts which have been submitted to me, I find that on one estate, shipping over 100 hogsheads, the cost of making each hogshead was not less than £19 14s. 1d., whilst the net proceeds were but £10 13s. 7d. per hogshead. On another estate, exporting over 160 hogsheads, the cost per hogshead was £17 17s. 2d., and the net proceeds £11 6s. 10d. per hogshead. There are, however, I am aware, some few exceptions, principally in the case of plantations managed by resident proprietors, in which the cost of manufacture has been moderate, and where the crop has, even at the late low prices, afforded a fair profit on the outlay. The small freeholders, too, find the cultivation of the cane very remunerative. There are some ten or twelve small sugar-works owned by them in the parish of St. George alone, three of which have been recently erected. On these, sugar of a good description is made, which finds a ready sale for island consumption."

NEW ZEALAND FLAX.—The *Lyttelton Times* says:—"The *Phormium tenax* has long been favourably known, but it has been difficult to bring it into use owing to the difficulty in extracting the fibre from the gum. Lately the number of experiments has greatly increased, and many processes have been discovered, in many of which the fibre was injured from being submitted to chemical action. A method has just been discovered which appears to be satisfactory, and is very simple. The flax, in its native state, without any preparation, is passed over a revolving cylinder, and, as it is gradually drawn along, is beaten by a heavy weight descending with great force, a stream of water being constantly poured on it. This process has now been used, and the rope manufactured from it is well known and appreciated in the market. A company has been formed, and, with its present machinery, they can produce six tons per week, at a cost of about £12 per ton. The value of the fibre in Sydney or Melbourne is from £35 to £40 per ton."

PAPER MANUFACTURE.—The manufacture of white paper has been commenced at the Ramsden Mill (Victoria), and a considerable quantity has been turned out. The paper is of the kind on which newspapers are printed, and is of fair quality. It weighs about 75 lbs. to the ream, is of even texture, free from blotches, and has a slight tinge of cream-colour. If somewhat thinner, and better glazed, and tougher, it would be as good printing paper as could be desired.

Obituary.

GUSTAVE FRÉDÉRIC WAAGEN, Professor in the University of Berlin, and Director of the Berlin Gallery of the Fine Arts. Dr. Waagen was well-known in Europe

as the author of an extensive work on the galleries of various countries, including those of Great Britain; he also acted as Fine Art Commissioner for Prussia at two or three of the universal exhibitions of London and Paris.

Publications Issued.

LATHES AND TURNING. By W. H. Northcott. (*Longman and Co.*) The author had been expecting to see the publication announced of a book on the subjects of which the present work treats, and also the completion of Holtzapffel's unfinished but long-promised "Mechanical Manipulation." Such a volume not having appeared, the author has endeavoured to write, in as small a compass as practicable, a work which, he hopes, will be found of service to the many who desire an acquaintance with these useful arts. There has been found considerable difficulty in acquiring information—otherwise than by practice—concerning the multiplicity of operations that can be conducted by the aid of the lathe; and judging from the numerous letters and inquiries on the subject appearing in the mechanical papers, it is thought that such a work as the present was wanted; for, although there are many books on turning already in existence, they are either too old to be now of much value—too expensive to be within reach of all—or their information, being confined to but one branch of the art, is too limited to be widely useful. The present work being designed to supply in some measure the existing deficiency, the information given is correspondingly comprehensive. All branches of turning are noticed, and a good deal of practical information is given upon each. Many operations and apparatus are described which do not properly come under the head of turning, but as they are to a great extent performed by means of the lathe, and as they are also exceedingly useful, the book is probably rendered more complete by including them.

Notes.

PARIS EXHIBITION, 1867.—The claims of certain foreign restaurants made againt the commission of the late exhibition, on account of the injury done to them by the erection of the "Concert Suffren," and other establishments, after their contracts had been made, have been recognised by the tribunals of Paris, which have accorded the following damages:—To the Swiss restaurant, 13,000 francs; to the Turkish, 14,000; to the Swedish, 17,000; to the Tunisian, 18,000; and to the Italian, 19,000 francs; in all, 81,000 francs.

ARCHÆOLOGICAL AND HISTORICAL CONGRESS.—An international congress, organized by the Antiquarian Society of the Rhine, is announced to be held at Bonn, from the 14th to the 21st of September, under the honorary presidency of Prince Frederick William of Prussia, and under the direction of M. Noggerath, president of the above society, and of M. Von Quast, conservator of the historical monuments of Prussia. The regulations are the same as those of the Antwerp congress held last year; all political and religious discussion is interdicted, and the proceedings will be conducted in the German language. The congress will be divided into three sections:—Antiquities of the early ages; Pagan; and Christian antiquities. Connected with the congress will be an exhibition of works of art and curiosities, from private collections or from churches which are little known, or possess special interest. At the conclusion of the congress excursions will be made to the churches of Schwarz-Rheindorf, Heisterbach, and Cologne, and other places of interest. Persons desiring to take part in the congress are to address themselves to the President of the Society of Antiquaries of the Rhine at Bonn; the subscription is almost nominal, namely, three thalers.

Correspondence.

WAGES OF COTTON WORKERS.—SIR,—Mr. J. Bailey Denton, in his valuable paper, reported in the *Journal of the Society of Arts*, May 22nd, there states "the weekly earnings of cotton workers to average 18s. 6d." I thought that perhaps a more detailed account of the earnings of persons of all ages, employed in cotton mills in this neighbourhood, might be of service to some of the members of the Society, and shall therefore feel glad if the enclosed tables are found of any use to any of them. I shall be glad to give any other information in my power. —I am, &c., P. O. WHITEHEAD.

Belmont, Rawtenstall.

TABLES showing the average, highest, and lowest wages received by males and females, and numbers employed at various ages, in a cotton mill in the centre of Lancashire, the time worked being sixty hours:—

MALES.

Age.	No.	Average.	Highest.	Lowest.
8 to 9	none			
9 to 10	6	£0 2 0	£0 3 0	£0 1 6
10 to 11	1	0 3 0	0 3 0	0 3 0
11 to 12	6	0 3 11	0 8 0	0 2 6
12 to 13	6	0 3 2	0 3 6	0 2 6
13 to 14	5	0 10 5	0 15 2	0 7 0
14 to 15	11	0 10 8½	0 17 8	0 7 0
15 to 16	6	0 11 6	0 15 0	0 9 6
16 to 17	5	0 11 10	0 17 6	0 8 6
17 to 18	7	0 11 4½	0 16 0	0 10 0
18 to 19	5	0 13 11	0 14 6	0 13 0
19 to 20	7	0 18 9	1 1 5	0 15 0
20 to 21	9	1 1 2	1 4 4	0 15 0
21 to 22	4	0 19 1½	1 1 0	0 16 0
22 to 25	18	1 3 2½	1 15 0	0 14 6
25 to 30	28	1 4 2	1 13 0	0 15 0
30 to 35	24	1 4 3½	1 15 1	0 17 0
35 to 40	11	1 5 6	1 13 6	0 16 0
40 to 50	11	1 7 7½	2 8 6	0 13 1
above 50	9	1 1 9	1 14 0	0 14 0

FEMALES.

Age.	No.	Average.	Highest.	Lowest.
8 to 9	3	£0 1 7	£0 1 9	£0 1 6
9 to 10	1	0 2 9	0 2 9	0 2 9
10 to 11	1	0 2 9	0 2 9	0 2 9
11 to 12	3	0 2 8	0 3 0	0 2 0
12 to 13	6	0 2 11	0 3 6	0 2 0
13 to 14	6	0 8 9½	0 11 10½	0 7 0
14 to 15	14	0 11 4½	0 18 0	0 7 6
15 to 16	11	0 13 10	0 18 5	0 9 0
16 to 17	12	0 15 0	1 2 0	0 9 7
17 to 18	11	0 14 10	1 2 7	0 9 0
18 to 19	12	0 16 0¼	1 2 6	0 11 0
19 to 20	11	0 16 1	1 5 0	0 9 7
20 to 21	9	0 16 9	1 3 0	0 14 0
21 to 22	8	0 15 10½	1 6 0	0 11 0
22 to 25	35	0 15 8¼	1 6 1	0 8 6
25 to 30	31	0 16 11	1 3 8	0 11 8
30 to 35	22	0 15 7	1 1 0	0 11 3
35 to 40	10	0 17 10	1 1 1	0 15 0
40 to 50	15	0 13 7½	1 4 2	0 8 9
above 50	2	0 12 2	0 13 0	0 11 4

Included in the above there are 49 married women, the youngest 21, the oldest 47, highest wage £1 1s., lowest 9s., average 15s. 5d.

THIRTEEN MARRIED COUPLES.

Age of man.	Age of woman.	Total earnings.
36	33	£1 16 6½
26	24	2 3 5½
33	33	2 1 4
24	28	1 19 9½
29	24	1 19 1½
27	25	2 7 8½
35	30	1 14 4
27	27	1 19 5
30	27	2 0 7
30	32	1 15 0
23	21	1 17 11
26	22	1 18 5½
24	23	1 16 4

FAMILIES AND PARTS OF FAMILIES.

No. of Members of Family Employed.	Age of man.	Age of woman.	Ages of sons.	Ages of daughters.	Total earnings.
4	48	..	22, 20, 16	..	£4 7 0
4	..	..	9	17, 14, 12	1 8 6½
3	35	..	..	12, 11	1 14 0
3	35	..	11	13	2 0 6
4	61	..	18	19, 16	2 18 7
3	47	..	..	19, 14	2 19 9
3	53	..	..	22, 17	2 8 10
4	..	40	17, 12, 9	..	1 8 3½
5	..	..	19	18, 16, 14, 8	2 14 2
3	..	..	17	19, 15	2 14 5
3	..	..	11, 10	14	0 14 0
3	36	33	14	..	2 17 8
4	..	..	..	21, 19, 16, 14	3 0 6
3	47	..	16	18	2 16 0½

N.B.—The time worked at present is about 40 hours per week. By the Factory Act children between the ages of 8 and 13 can work half time, all above that age can work full time.

Patents.

From Commissioners of Patents' Journal, August 14.

GRANTS OF PROVISIONAL PROTECTION.

Animal and vegetable substances, preserving—2384—J. Jeffreys.
Bell-pulls—2345—A. C. M. Prince.
Boilers—2346—W. R. Lake.
Boilers, water-feeding apparatus for—2406—P. N. J. Macabies.
Boilers, &c.—2424—M. Wilkin and J. Clark.
Boilers, &c., preventing incrustation in—2412—A. F. Leale.
Buildings, construction of—2386—G. Woodhouse & J. G. McMinnies.
Caloric, &c., application of—2363—T. Hydes and J. Bennett.
Cannon—2397—J. C. Haddan.
Carding engines—2402—F. A. Leigh.
Carriages, retarding and stopping—2390—T. H. Roberts & B. C. Cross.
Cinder sifter and shovel combined—2374—J. Mabson.
Colouring matters, red—2296—J. H. Johnson.
Cotton, &c., opening and cleaning—2338—J. Greenhalgh.
Cranes—2247—W. I. Ellis.
Desks for schools—2438—T. Ward.
Distillation—2396—T. Prosser.
Door springs and spring hinges—2307—H. Fear.
Drawing pens and compasses—2432—L. C. Bailey.
Dredgers—2382—H. O. Robinson.
Eggs, preparing—2367—C. A. La Mont.
Electric battery—2392—G. Davies.
Eyelets, metallic—2422—J. A. McKean.
Fabrics, cut pile—2383—S. C. Lister.
Fibres, opening and straightening—2344—R. Newton.
Filamentous matters, &c., drying—2339—C. E. Brooman.
Fire-arms, breech-loading—2377—W. R. Lake.
Flax, treating—2312—E. T. Hughes.
Flour, dressing—2393—J. Duguid, jun.
Fluids, cooling, &c.—2408—G. D. Kittoe and P. Brotherhood.
Fluids, &c., measuring—2328—G. Smith.
Gas and vapour, manufacturing, &c.—2364—J. Webster.
Gas burners, flame spreader for—2395—J. H. Johnson.
Heat, increasing by combustion of fuel, &c.—2352—J. Lewis.
Heliographic plates for printing, obtaining—2391—G. Davies.
Ice, artificial—2357—A. M. Clark.
India-rubber, &c., substitute for—2404—A. G. Day.
Indicators of time and distance for vehicles, &c.—2354—H. A. Dufrené.
Ink, copying—2163—J. F. Cooke.
Iron and steel—2381—J. Radcliffe.
Iron and steel, cast and wrought—2334—J. H. Johnson.
Iron and steel, wrought—2177—J. Harris and V. Pendred.
Life-preserving apparatus—2353—C. J. Laurendeau.
Looms—2365—G. Hodgson, H. Bottomley, and E. Cockroft.
Looms—2366—J. Bullough.
Malt or sugar, treating saccharine solutions of—2375—E. Herring.
Metals, separating from their ores, &c.—2343—L. Wray.
Millstones, dressing—2330—R. Young.
Millstones, dressing—2394—J. Rawsthorn.
Motion, converting circular into reciprocating—2301—W. T. Hamilton.
Motive-power, obtaining and applying—2348—A. J. Thorman.
Musical instruments—2184—J. H. Johnson.
Needle wrappers—2360—W. Lewis.
Needles—2370—A. Morrall.
Paint and varnish, preparing—2376—W. R. Lake.
Paper bags and envelopes, making—2193—W. Russell.
Paper, manufacturing—2388—C. H. Roeckner.
Powder, cutting and polishing—2379—A. V. Newton.
Pumps, &c.—2398—J. and H. A. Gwynne.
Railway, portable—2342—A. V. Newton.
Railway rails—2361—H. Watts.
Railway rails—2400—C. D. Fox.
Railway rolling stock—2399—T. C. Fidler.
Sewing machines—2378—W. R. Lake.
Ships, iron or steel, sheathing with zinc, &c.—2326—N. Barnaby.
Ships' propellers, &c.—2355—A. V. Newton.
Silk velvets—2389—S. C. Lister.
Sliding door rollers—2324—R. G. Hatfield.
Smoke, preventing—2336—J. Young, R. Pollock, and J. Morrison.
Straw, &c., elevating—2170—W. Tasker, jun.
Telegraphic cables, strips of zinc, &c., for use in the manufacture of—2380—J. R. Harper.
Train intercommunication—2369—S. M. Martin and S. A. Varley.
Valves—2385—J. Wolstenholme.
Valves—2420—J. E. Outridge.
Valves, self-acting—2323—A. Bochkoltz.
Wheels, toothed, moulding—2372—J. Simpson.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Crane and locomotive engine combined—2488—H. Dübs.
Fabrics, felted—2465—W. R. Lake.
Sewing machines—2473—N. Salamon.

PATENTS SEALED.

169. W. R. Lake.
503. G. V. Wisedill.
507. R. H. Rimes.
508. D. Whittaker.
509. W. Easterbrook.
511. E. Cottam.
514. J. Barlow.
517. J. Clark and T. Vicars.
521. W. H. Wilkinson.
534. C. E. Brooman.
535. W. Perkins & G. G. Tandy.
539. W. Weild.
543. T. Beeley.
544. R. Blezard.
545. J. Kirkland.
547. W. and J. Cooke.
548. E. W. Young.
549. J. J. King.
550. W. H. Steel.
558. W. S. Guinness.
560. L. B. Joseph.
561. M. Henry.
563. P. Bauer, J. Johnson, and W. Jones.
564. J. M. Kilner.
570. T. A. L. Murray.
574. W. R. Lake.
579. C. Cochrane.
585. J. Wheatley.
606. A. Stenger.
620. J. Elce.
628. F. Remy.
637. A. M. Birchall.
640. T. Lythgoe & H. Thornton.
662. W. Weldon.
688. J. Gjers.
699. J. L. Norton.
844. J. Bourne.
853. W. E. Newton.
860. G. F. Lyndon.
876. J. Clay.
894. J. H. Johnson.
1018. A. V. Newton.
1250. J. H. Johnson.
1439. H. Y. D. Scott.
1519. J. Norman.
1522. S. Moulton.
1784. J. Harman.
1860. J. Dewar.
1924. G. Davies.

From Commissioners of Patents' Journal, August 18.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2064. C. West.
2096. R. A. W. Westley.
2137. R. A. Brooman.
2100. J. T. Lockey.
2135. A. and W. Young.
2165. H. Willis and G. Rice.
2256. W. Clark.
2197. J. Symonds.
2111. J. Billings.
2151. W. Soper.
2173. J. Moody.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2117. J. Cranston.
2148. S. Corbett.
2038. C. W. Kesselmeyer and T. Mellodew.